From our research, there are 4 primary radioactive waste disposal sites for bulk material. They are located in Texas, Colorado, Utah, and Idaho. There also exists a subtitle C landfill in Michigan that can accept limited concentrations of TENORM. Due to mergers and acquisitions over the past few years, the industry has become vertically integrated whereby the companies that own the disposal sites can also offer transportation services.

Two of the disposal were contacted and provided a cost estimates for T&D based upon the following information:

- The projected volume of radioactive waste is estimated to be 13,000 Cubic Yards (CY) for FY2016. Note for purposes of this estimate, a CY of waste is approximately equivalent to 1 ton, so the units are interchangeable.
- The waste material is primarily soil but may contain some building rubble. We did not ask any questions about allowable soil moisture content but should be considered when preparing the bid document.
- The waste is contaminated only with radionuclides. No hazardous constituents were identified. If the waste is found to be also hazardous, ie "mixed waste", these cost estimates are probably not accurate.
- The maximum concentration detected in the characterization samples were Th-232 at 15 pCi/g, Ra-226 at 15 pCi/g, and U-238 at 4 pCi/g, plus associated daughter products from each of these isotopes.
- Due to these low concentrations, the waste is exempt from regulations regarding the shipment of DOT class 7 radioactive materials.

The cost estimates received were from Energy Solutions and US Ecology.

1. **Energy Solutions** operates the radioactive disposal site in Utah, and probably has the broadest license to receive higher concentrations of more radionuclides. They have been in business for about 25 years under various names, and have had substantial disposal contracts with DOE, EPA, and many industrial clients. By acquisition a few years ago they acquired MHF Logistical Solutions which Weston has used in the past for transportation assistance. The person we spoke with was Scott Dempsey of MHF (724-312-6244). Scott confirmed that while they are a subsidiary of Energy Solutions, they can provide transportation support to other disposal providers. Scott estimated the cost to package, transport, and dispose of the material in Energy Solutions facility in Clive Utah at **$450 to $500 per CY**, with the transportation and disposal costs about equal. Scott recommended that the soil be packaged in "lift liners", also called "super sacks", loaded onto flatbeds, and trucked to one of their rail trans loading facilities, where they would be loaded into gondolas and rail shipped to the Clive disposal site. **Assuming 13,000 CY of material, the budgetary estimate is then $5.9 million to $6.5 million.**

2. **US Ecology** operates the disposal site in Idaho, plus a few months ago they acquired the aforementioned subtitle C disposal site in Michigan. US Ecology has been in business for at least 40 years under various names, but the Idaho disposal site for bulk radioactive waste material has been open for about 10 years. The person we spoke with was Tim Curtin (908-419-6685). Based on the concentrations given, Tim recommended that the waste be trucked directly from Niagara Falls to their disposal site near Belleville, MI. He

estimated the T&D cost to be **$200 to $250 per CY**. **Assuming 13,000 CY of waste, the budgetary estimate is $2.6 million to $3.3 million.**

Note: Internet search results found that the state of Michigan may be reviewing their permit for radioactive contaminants. While Tim confirmed their ability to receive this waste at this time, I wonder if this option may be unavailable by the time the project needs disposal support.

1) Transportation may be the biggest factor, but disposal rates vary between sites also.
2) Staging material on-site is usually a state/local issue largely influenced by community relations issues. If residents are unhappy staging may be unpopular and not allowed. If no issues, staging for a limited time may be acceptable. Bottow line; that is not a health physics issue and would require research to determine a definite answer.